

CLAIMS:

1. A method of preparing a dialkyl carbonate, comprising:

reacting an alkanol, oxygen, carbon monoxide, and a catalyst to form a mixture comprising a dialkyl carbonate and an alkyl chloroformate;

separating from the mixture a gaseous fraction comprising alkyl chloroformate; and

removing alkyl chloroformate from the gaseous fraction.
2. The method of Claim 1, wherein the alkanol comprises a C₁-C₁₂ alkanol.
3. The method of Claim 1, wherein the alkanol comprises a C₁-C₆ primary alkanol.
4. The method of Claim 1, wherein the alkanol comprises methanol.
5. The method of Claim 1, wherein the alkanol, the oxygen, and the carbon monoxide are reacted in a molar ratio of (about 0.5 to about 0.7 alkanol):(about 0.04 to about 0.06 oxygen):(about 0.8 to about 1.2 carbon monoxide).
6. The method of Claim 1, wherein the catalyst comprises a metal selected from the group consisting of iron, copper, nickel, cobalt, zinc, ruthenium, rhodium, palladium, silver, cadmium, rhenium, osmium, iridium, platinum, gold, mercury, and combinations comprising at least one of the foregoing metals.
7. The method of Claim 1, wherein the catalyst comprises copper.
8. The method of Claim 1, wherein the catalyst comprises chloride ion.
9. The method of Claim 1, wherein the catalyst comprises chloride ion and copper in a molar ratio of about 0.5 to about 1.5.

10. The method of Claim 1, wherein the separating from the mixture a gaseous fraction is performed in a gas-liquid separator.

11. The method of Claim 1, wherein removing alkyl chloroformate comprises utilizing at least one technique selected from the group consisting of condensing, adsorbing, absorbing, separating with a membrane, exposing to a stoichiometric reagent, exposing to a catalytic reagent, and combinations comprising at least one of the foregoing techniques.

12. The method of Claim 1, wherein removing the alkyl chloroformate comprises feeding the gaseous fraction to a knock out drum.

13. The method of Claim 12, wherein the temperature of the knock out drum is about -50°C to about 0°C.

14. The method of Claim 1, wherein removing the alkyl chloroformate comprises feeding the gaseous fraction to at least two knock out drums.

15. The method of Claim 1, wherein removing the alkyl chloroformate comprises feeding the gaseous fraction to an absorber.

16. The method of Claim 15, wherein feeding the gaseous fraction to an absorber comprises contacting the gaseous fraction with an absorbing fluid capable of absorbing the alkyl chloroformate from the gaseous fraction.

17. The method of Claim 16, wherein the absorbing fluid comprises a liquid reactant.

18. The method of Claim 16, wherein the absorbing fluid comprises the alkanol.

19. The method of Claim 16, wherein the absorbing fluid comprises the dialkyl carbonate.

20. The method of Claim 16, wherein the absorbing fluid has a temperature of about -10°C and about 40°C.

21. The method of Claim 1, wherein at least about 80% of the alkyl chloroformate is removed from the gaseous fraction.

22. The method of Claim 1, wherein at least about 90% of the alkyl chloroformate is removed from the gaseous fraction.

23. The method of Claim 1, wherein at least about 95% of the alkyl chloroformate is removed from the gaseous fraction.

24. The method of Claim 1, wherein at least about 99% of the alkyl chloroformate is removed from the gaseous fraction.

25. The method of Claim 1, wherein the removing alkyl chloroformate comprises reducing the concentration of the alkyl chloroformate to less than about 500 parts per million by weight, based on the total weight of the gaseous fraction after removing alkyl chloroformate.

26. The method of Claim 1, wherein the removing alkyl chloroformate comprises reducing the concentration of the alkyl chloroformate to less than about 100 parts per million by weight, based on the total weight of the gaseous fraction after removing alkyl chloroformate.

27. The method of Claim 1, wherein the removing alkyl chloroformate comprises reducing the concentration of the alkyl chloroformate to less than about 30 parts per million by weight, based on the total weight of the gaseous fraction after removing alkyl chloroformate.

28. The method of Claim 1, further comprising feeding the gaseous fraction to a cold wash unit.

29. The method of Claim 1, wherein the gaseous fraction further comprises carbon monoxide.

30. The method of Claim 29, further comprising recycling carbon monoxide from the gaseous fraction to the reactor.

31. A method of preparing a diaryl carbonate, comprising:

reacting an alkanol, oxygen, carbon monoxide, and a catalyst to form a reaction mixture comprising a dialkyl carbonate and an alkyl chloroformate;

separating from the reaction mixture a first liquid fraction comprising dialkyl carbonate and alkyl chloroformate, and a first gaseous fraction comprising carbon monoxide and alkyl chloroformate;

removing alkyl chloroformate from the first gaseous fraction by feeding the first gaseous fraction to a first absorber to produce an alkyl chloroformate-depleted first gaseous fraction;

separating from the first liquid fraction a second gaseous fraction comprising carbon monoxide and alkyl chloroformate; and

removing alkyl chloroformate from the second gaseous fraction by feeding the third gaseous fraction to a second absorber to produce an alkyl chloroformate-depleted second gaseous fraction.

32. An apparatus for preparing a dialkyl carbonate, comprising:

means for reacting an alkanol, oxygen, carbon monoxide, and a catalyst to form a mixture comprising a dialkyl carbonate, an alkyl chloroformate, hydrochloric acid, water, carbon dioxide, and carbon monoxide;

means for separating from the mixture a gaseous fraction comprising carbon monoxide and alkyl chloroformate; and

means for removing alkyl chloroformate from the gaseous fraction.

33. An apparatus for preparing a dialkyl carbonate, comprising:

a reactor for producing a mixture comprising a dialkyl carbonate, carbon monoxide, and an alkyl chloroformate;

a gas-liquid separator for separating from the mixture a gaseous fraction comprising carbon monoxide and alkyl chloroformate, wherein the gas-liquid separator is in fluid communication with the reactor; and

a knock out drum for removing alkyl chloroformate from the gaseous fraction, wherein the knock out drum is in fluid communication with the gas-liquid separator.

34. The apparatus of Claim 35, further comprising a cold wash unit for removing organic impurities from the gaseous fraction, wherein the cold wash unit is in fluid communication with the reactor and the absorber.

35. An apparatus for preparing a dialkyl carbonate, comprising:

a reactor for producing a mixture comprising a dialkyl carbonate, carbon monoxide, and an alkyl chloroformate;

a gas-liquid separator for separating from the mixture a gaseous fraction comprising carbon monoxide and alkyl chloroformate, wherein the gas-liquid separator is in fluid communication with the reactor; and

an absorber for removing alkyl chloroformate from the gaseous fraction, wherein the absorber is in fluid communication with the gas-liquid separator.

36. The apparatus of Claim 35, further comprising a cold wash unit for removing organic impurities from the gaseous fraction, wherein the cold wash unit is in fluid communication with the reactor and the absorber.

37. An apparatus for preparing a dialkyl carbonate, comprising:

a reactor for reacting an alkanol, oxygen, carbon monoxide, and a catalyst to produce a reaction mixture comprising a dialkyl carbonate, an alkyl chloroformate, hydrochloric acid, water, and carbon dioxide;

a first gas-liquid separator for separating from the reaction mixture a first liquid fraction and a first gaseous fraction comprising carbon monoxide and alkyl chloroformate, wherein the first gas-liquid separator is in fluid communication with the reactor; and

a second gas-liquid separator for separating from the first liquid fraction a second liquid fraction and a second gaseous fraction comprising carbon monoxide and alkyl chloroformate, wherein the second gas-liquid separator is in fluid communication with the first gas-liquid separator;

a first absorber for removing the alkyl chloroformate from the first gaseous fraction, wherein the first absorber is in fluid communication with the first gas-liquid separator; and

a second absorber for removing the alkyl chloroformate from the second gaseous fraction, wherein the second absorber is in fluid communication with the second gas-liquid separator.

38. The apparatus of Claim 37, further comprising a cold wash unit for removing organic impurities from the first gaseous fraction and the second gaseous fraction, wherein the cold wash unit is in fluid communication with the first absorber and the second absorber.

39. The apparatus of Claim 37, further comprising a compressor in fluid communication with the second absorber.